



## The Reform and Exploration of Intelligent PYTHON Language Teaching

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Yutian Huang, Juanjuan Zhao, Yan Qiang, Tengxuan Hou,  
Xiaoling Ren and Huanwu Sun

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# The Reform and Exploration of Intelligent PYTHON Language Teaching

1<sup>st</sup> Yutian HUANG

Graduate School of information and computer science  
Taiyuan University of Technology  
Taiyuan, China  
Huangyutian@tyut.edu.cn

3<sup>rd</sup> Yan QIANG

Graduate School of information and computer science  
Taiyuan University of Technology  
Taiyuan, China  
qiangyan@tyut.edu.cn

5<sup>th</sup> Xiaoling REN

Graduate School of economics and management  
Taiyuan University of Technology  
Taiyuan, China  
renxiaoling2013@163.com

2<sup>nd</sup> Juanjuan ZHAO

Graduate School of information and computer science  
Taiyuan University of Technology  
Taiyuan, China  
zhaojuanjuan@tyut.edu.cn

4<sup>th</sup> Tengxuan HOU

Graduate School of information and computer science  
Taiyuan University of Technology  
Taiyuan, China  
1055306071@qq.com

6<sup>th</sup> Huanwu SUN

College of Mechanical and Vehicle Engineering  
Taiyuan University of Technology  
Taiyuan, China  
sunhuanwu@tyut.edu.cn

Abstract—with the continuous improvement of social productivity, various fields also develop rapidly. All levels of practitioners also need to improve their own comprehensive quality and ability. In the field of artificial intelligence and high-end computer industry, the Python programming language gradually shows its field advantages and is favored by professionals, thus accelerating the development of scientific research and high-tech products. Teachers or trainers should understand and teach PYTHON courses at a deeper level and reform PYTHON language teaching based on this. With the maturity of artificial intelligence technology and the continuous development of programming languages, Internet companies have an increasing demand for programming talents. Therefore, how to cultivate excellent PYTHON programmers has drawn close attention from all fields of society. In the era of intelligence, it is one of the main tasks of schools to train PYTHON programming talents to meet the needs of the society. The traditional PYTHON language teaching model can no longer meet the needs of society. This paper proposes to build a kind of intelligent online PYTHON teaching system, provide students with personalized teaching resources and systematic practical programming problems, and then cultivate students' independent programming thinking, and train practical talents who master PYTHON programming technology for Internet enterprises. Promote the education with practice, not only can improve students' learning enthusiasm and motivation, increase employment opportunities for students, at the same time satisfy the social demand for talents, thus promoting the schools' curriculum reform.

Index Terms—PYTHON programming, Intellectualization, curriculum reform, PYTHON language teaching

## I. Introduction

From the middle of the 20th century to the present, the computer field has experienced rapid development

during the 70 years, emerging a variety of programming languages, such as Pascal, C, C++, Java, C#, and so on. These different languages reflect different design philosophies, and also reflect the characteristics of that era. Every computer programming language has its disadvantages and limitations. Guido von Rossum, one of the top programmers in the Netherlands, wanted a programming language that combines the ability of C to quickly invoke computer interfaces with the advantages of rapid programming of scripting language. PYTHON was created based on this requirement. Compared with other languages such as Java and C/C++, PYTHON has the following advantages :

- It is easy to learn. The PYTHON language is simple to learn, its syntax is simple, and it is easy to practice, which stimulates students' enthusiasm for learning and makes them more focused on solving practical problems rather than simply learning the language itself.
- It is highly explanatory. Code written in PYTHON does not need to be compiled into binary and can run source code programs directly, highlighting that PYTHON is simpler and easier to port.
- Object orientation. PYTHON is not only process-oriented programming, but also object-oriented programming.
- High scalability. To improve efficiency, the PYTHON language uses C/C++ to write the underlying code and call them in PYTHON programs.

- Hybrid programming. PYTHON is also known as the glue language because it can be mixed with other programming languages to take advantage of existing toolkits.
- Abundant resources. PYTHON has a rich library of standards, with numpy for scientific computing and matplotlib for data visualization. As a cross-platform programming language, PYTHON has been ported to many platforms, represented by Linux, Windows, Mac and Android. The PYTHON language is gradually spreading in various fields with its advantages, and at the same time, online teaching of the PYTHON language is also on the rise.

MOOC is an open and large-scale online learning platform, and there are a large number of users to conduct online teaching on MOOC (Massive Open Online Course), and the teaching of PYTHON language on this platform is particularly hot. MOOC platform and other similar online PYTHON teaching platforms have the following characteristics:

- large-scale learning group. There are large number of students, many cooperative universities, and a large number of teachers and team to participate it; It provides abundant online courses and optimizes learning resources. The online learning platform integrates various excellent resources through the Internet and breaks the limitation of time and space, so that the offline education can be popularized and opened to a wider area across the campus. Online education can spread the best teaching resources everywhere through the Internet.
- Opening up educational resources. This way of education breaks the limitation of time and space of offline education and expands the number of people who need to receive education. Due to the limitation of time and space, the traditional education is extremely inflexible. Online education, by virtue of various information technologies, such as multimedia technology and mobile information technology, transcends time, space and region, realizes real-time or non-real-time communication, making up for the shortcomings of offline education, enabling learners to study anytime and anywhere. In addition, learners can also determine the pace of learning according to their own goals, making the learning process extremely flexible. Online education increase the source of students with advanced network communication technology. From the results of the audience, it can be concluded that white-collar workers who have strong professional ability and need to improve and college students who are about to graduate are the most concerned groups.
- online. All you need is a computer and Internet. Using MOOC to offer PYTHON teaching among college students has the following advantages: MOOC are not limited by the teaching space and time, which

can greatly stimulate the initiative and enthusiasm of college students. MOOC is a digital teaching platform that enables users to access through information tools such as tablets, laptops, or smartphones, and design learning content on demand, regardless of time and space.

In real work or real life, the problems faced are more complex and difficult to handle. To solve this kind of problem, we need systematic thinking, make the complexity simple, break down the big problem which is difficult to deal with into a small problem which is easy to solve, and then assign the small problem to the person in charge to solve it. This way can solve the problem effectively. And in the allocation of small problems, we must consider the individual strengths of the person, and allocate the small problems that suit him, and let them use their strengths to solve them. PYTHON programming language teaching follows this rule. It guides students in the process of learning to simplify complex problems, use simple language programs to assemble and complete large practical tasks, and finally solve problems. Because of the flexibility of the PYTHON language, there are a number of solutions to the problem. To sum up, in the teaching process of PYTHON programming language, we should pay attention to cultivate students' vivid understanding of program code, and then cultivate students' diversified computational thinking. The teaching mode not only helps students to improve their interest in learning program language, but also stimulates students to develop a variety of algorithms, so as to improve their computational thinking and comprehensive prime value.

MOOC can be customized the learning content to meet the needs of students according to the requirements of the society for the teaching of the curriculum. Different teaching and learning environment styles can improve students' learning initiative and enthusiasm and improve their learning efficiency, thus directly affecting the learning effect. MOOC platforms have improved the teaching quality to some extent. From the perspective of schools, when a school puts its teaching resources online, it needs to carefully screen and develop existing teaching courses, and put online courses that can represent the level and characteristics of the school, which confirms that MOOC is "expensive and valuable" with quality effects. From the perspective of the teaching team, during the MOOC construction, the course team must conduct in-depth research on "teaching philosophy" and "course design". In order to ensure that different learners realize their learning objectives, it is necessary to carefully condense the course content and track the learning behavior of tens of thousands of learners so as to provide continuous solutions [2].

In the online teaching practice, the teaching team has produced unprecedented tension and concentration. This kind of online course construction is no longer a routine teaching activity, it has far exceeded the scope of offline

teaching organizations, becoming a conscious teaching management of the teacher team. Every teacher has to solve students' puzzles and conduct online discussions almost every day. Moreover, when recording the teaching contents of online courses, each teacher imparts the teaching contents very seriously, and participates in the recording of the courses with his best teaching state, ensuring the teaching effect and improving the education quality.

As the natives of the Internet, students have got used to the way of learning and communicating on the Internet. Many online learning platforms implement the whole process of education on the Internet with the concept of openness and sharing. However, there are still many problems in the current online platform, and it is necessary to implement the computer revolution to solve these problems.

## II. Problems in online platform for PYTHON language teaching

### A. The teaching quality is facing a test

As one of the typical online teaching modes, there exists the phenomenon of real-time supervision weakening of teachers in MOOC. A large number of online courses often play the recorded teaching content of the teacher in advance. In the absence of real-time online guidance from the teacher, it completely depends on the students' self-control ability to ensure the smooth teaching and learning. Without online guidance from teachers, students often fail to understand or even misunderstand part of the teaching content in the learning process, virtually increasing the ineffective learning time and reducing students' learning enthusiasm. For students with weak self-control and binding force, it is easy for them to give up or devote themselves to other courses, resulting in a low completion rate of online learning. In addition, in the process of real-time online teaching by teachers, students and teachers basically rely on public screen typing for communication. Sometimes the questions raised by students will be considered worthless by the teachers or ignored because the teachers do not pay attention to the public screen in various situations. When this happens, the students themselves may feel that there is no learning atmosphere, leading to students' weariness of learning. Furthermore, group discussion on online teaching platform is difficult to carry out, the frequency of interaction between teachers and students is reduced, which is not conducive for their emotional exchange. Excessive study time may cause students to interrupt their thinking. These problems will be the reason for the low quality of online teaching.

### B. Students' personalized needs cannot be satisfied

Because of the differences in students' learning ability, level and the diversity of online courses, the PYTHON language training courses on MOOC platform may not be

able to adapt to students at all levels. Although PYTHON language is a general education course, the teaching contents of college teachers or offline educational institutions should not only reach the basic teaching objectives, but also have different emphases and teaching methods for the same contents for students with different majors and backgrounds. Most online PYTHON courses only teach students the basic knowledge of programming language and basic writing specifications, lacking of specific training combined with projects, which makes students feel confused and even mistakenly believe that these courses are not practical after learning the basic knowledge of programming language. Learning programming language in project practice not only enables students to write code skillfully, but also enables students to understand the current cutting-edge knowledge. However, it is difficult for online teaching platforms to "teach students according to their aptitude".

### C. Teaching time is lengthened invisibly

Online teaching enables students to use spare time to learn PYTHON courses, leading to repeated viewing of the same courses, which not only wastes learning time, but also reduces learning efficiency. Supervised centralized learning enables students to receive more knowledge and complete more practical training in a short period of time. Fragmented learning makes full use of spare time, but reduces students' learning efficiency. Long-term fragmented online learning tends to make students lose their enthusiasm and initiative in learning.

### D. The assessment and supervision system are not perfect

Students' learning effect and academic performance are often related to test results. Many online platforms assess whether students have completed the courses they are studying according to their progress in the course. This single metric cannot truly evaluate the learning effect of students. The purpose of the learning course is to enable students to gain in the course, and to complete the learning content while understanding the learning purpose. Although some platforms will evaluate the learning effect of students through the form of test after the end of the course, the imperfect system and loose management will cause students to complete only the test questions and ignore the real purpose of the assessment. The singularity of assessment standards in experiments, training and others, and the lack of timely feedback are not conducive to the cultivation of students' practical ability.

### E. Lack of content suitable for online education

At present, education in China grows from the bottom of the industrial chain. Due to the single examination standard, that is, the "one-size-fits-all" by the government, domestic intellectual property rights cannot be valued and protected for a long time, the content of school teaching is basically based on examination questions, and lacks

the ability to keep pace with the times and develop independently. After the emergence of online education, despite advanced hardware tools, the content is difficult to meet the development needs of online education. For example, in PYTHON online teaching, students often need to improve programming skills, improve programming literacy, and cultivate efficient programming habits from real project practice. Engineering projects are the best case for online teaching, but some project practices often involve bids from private companies or departments, and it is difficult to transfer them from private to public teaching. In addition, according to statistics, there are a large number of similar teaching resources in various major online teaching platform and there are tens of thousands of basic PYTHON programming courses alone with same teaching contents, leading to single online teaching content and lack of teaching resources.

### III. Construct the ability-oriented personalized experimental teaching system

#### A. Construct an intelligent platform across time and space

The construction of inquiry-based and heuristic teaching platform in MOOC greatly stimulates students' enthusiasm for learning knowledge [4]. Combining artificial intelligence and taking it as the cognitive premise, the students' preliminary cognition is established by showing the mature cases through the film. In the intelligent platform, the advantages of PYTHON development language are vividly explained in the form of a film to enhance students' awareness of active learning. In addition, a new PYTHON teaching mode is introduced, which embeds the intelligent programming platform into the PYTHON class to assist teaching. In combination with the actual situation of students, we should take sufficient time to organize students to have interactive discussions on the Internet, and comb the teaching contents studied in the film. At the same time, each student should express his own views and understanding of PYTHON language, communicate with each other, stimulate the desire to learn, and make comprehensive preparations for the final online leaning and practice.

#### B. Personalized allocation of network teaching resources

PYTHON programming language is a course closely combining with theory and practice. Experiments and practical teaching play an important role in the teaching of programming. The quality of experimental results directly affects the learning effect of students. It is an important link to improve students' programming ability to conduct "intensive explanation and more practice" and to strengthen computer experiment teaching [3]. The intelligent training platform obtains the student's learning status, learning effect, and learning mode by recording various types of students' learning process data, assessment data, interactive data, etc, and using big data analysis technology to integrate and analyze the

recorded data. And according to the final student learning process, it can integrate network resources, personalize the design and launch of its learning and training plan, so as to "teaching students according to their aptitude". For PYTHON teaching, according to the feedback data of the intelligent platform, learning videos, exercises and experiments corresponding to each student's learning ability are designed and distributed for each student, so as to improve the students' programming ability.

#### C. Construction of intelligent real-time assessment programming system

A whole-process and diversified assessment method is adopted to include the whole process of students' learning into the assessment scope [4]. The platform monitors students' learning situation in real time, so that students attach importance to the learning process and ability cultivation. The course assessment generally adopts a combination of the usual programming experiment quiz and the end-of-class programming exam, while increasing the proportion of experimental programming in the class, organizing the test of the knowledge points of the key chapters. For students who fail the test, we will issue programming questions that match the content for students to focus on them, so as to create a cloud platform for programming ability training, so that students can conduct programming training online anytime and anywhere. The platform can intelligently and automatically guide students to program, point out programming errors, teach programming skills, and record students' learning process. The students' experimental programming scores and classroom learning scores in the online platform are included in the assessment of the final scores, which more comprehensively reflects the students' understanding of basic theoretical knowledge, learning degree and the ability to program with knowledge.

#### D. Construction of regular and quantitative learning task

The intelligent PYTHON learning platform customizes quantitative learning courses for students according to the learning content and learning purpose, and allows students to automatically set the learning time of courses in the same mode as offline teaching. It requires students to complete the required learning content in the specified time and submit it to the platform for evaluation of learning quality. Online learning still follows the timing advantage of offline learning, giving students the same motivation as real-life teaching to complete online PYTHON courses. Combining offline advantages with online methods, it can better improve the learning effect of students and improve the platform's use efficiency.

#### IV. The effect and thinking of intelligent PYTHON language teaching reform

##### A. Students are enthusiastic about learning and teaching quality is improved

Interest is the biggest motivation for learning. By making students interested in learning PYTHON, they can get twice the result with half the effort and directly feel the powerful functions and wonders of PYTHON, so as to enhance their learning enthusiasm and initiative. The film-type exhibition and the introduction of artificial intelligence life cases have greatly inspired the students' enthusiasm for learning. So far, 6,100 students have participated in the new intelligent platform for learning. The total duration of the video course is 168 hours (including the explanation of the exercises after class). The students ran the code for 5.4 million times, with an average of 980 times per person. On average, each student spent about 8 hours on the platform to learn the knowledge of video lessons and practice. 80 percents of the students spent more than 7.5 hours on coding learning and practice (including learning and practice time). The intelligent platform forms a teaching service system integrating teaching materials, teachers and auxiliary teaching platforms, which enables students to learn and practice anytime and anywhere, and turns the protagonist of the course into students. Meanwhile, students can get timely help during the learning process with the intelligent AI feedback technology of platform.

##### B. Meet students' personalized needs

Through the reform and innovation of the teaching mode of the primary PYTHON language programming course, the teaching mode and teaching method of PYTHON language have been improved, and the learning methods and learning skills of students have also been changed. The smooth implementation of MOOC+ alpha platform provides excellent network resources for students. From the beginning of the course to the end, the whole process will intelligently track and manage each student's learning progress, learning quality and learning effect [5], grading according to the each stage or completion of task, and assign each student appropriate courses and practical exercises according to the final score. According to the analysis of the platform assessment data, it is found that girls in online learning are generally better at mastering the basic knowledge of PYTHON and have better performance in in-class assessment tests, which is due to the advantages of girls in class concentration, hard work and learning attention. While boys are better than girls in the simplicity of programming, which may be because boys are more flexible in thinking. Based on the above analysis result, intelligent platform will provide girls with more programming exercise in order to improve the practice ability of girls. On the premise of stabilizing practical ability, boys are assigned more

theoretical knowledge to improve their comprehensive capabilities for different shortcomings.

##### C. Improvement of students' programming ability

Integrate the resources of the whole network to enrich the PYTHON course, and improve the construction experiment question bank of key chapter, experiment question bank of key content, periodic assessment question bank, courseware and case library of each chapter. After periodic intelligent feedback learning and training, students can not only quickly establish the thinking of program design, efficiently master PYTHON grammar, and fully understand the object-oriented programming ideas, but also generate continuous learning interest and improve students' programming ability through intuitive and interesting experimental results, as shown in Figure 1. In the process of teaching, pay attention to students' feedback, the course assessment focuses on process assessment, and the final assessment adopts the project system, which focuses on evaluating students' logical abilities, comprehensive use of programming knowledge, planning organization and practical abilities, and encourages students to innovate [6].

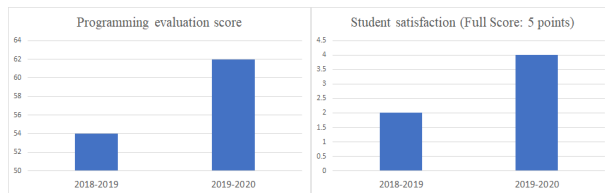


Fig. 1. Comprehensive test scores and student satisfaction scores.

##### D. Achieve systematic learning

By learning PYTHON courses on this platform, a large number of non-computer majors have developed great interest in the fields related to computer programming, as shown in figure 2, and are committed to employment in the field of artificial intelligence in the future. Therefore, it can be seen that PYTHON courses on this platform are very attractive to students. This platform can not only realize systematic learning but also solve difficult problems of students in real time. It can provide corresponding learning strategies for each student's shortcomings, greatly improving students' awareness of active learning and their programming ability. Due to online open learning, the popularization of artificial intelligence has been further improved and more talents can be transferred into the field of computer programming application.

#### V. Conclusions

The emergence of each programming language is closely related to the needs of the era. The same is true of PYTHON. PYTHON has a rich third-party toolkit and standard library, which makes it convenient to handle all kinds of data. Moreover, as an open language, it is

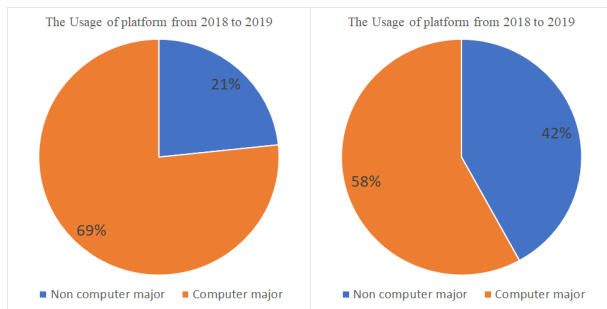


Fig. 2. the proportion of computer majors and non-computer majors learning PYTHON language.

characterized by high efficiency and easy to learn. Practice has proved that PYTHON has many advantages in data visualization, image processing and deep neural network, etc. The development in recent years has gradually formed and improved the PYTHON computing ecology. Based on years of practical teaching effects, if students can quickly write powerful application modules based on PYTHON, it is of great benefit to enhance students' interest in learning and improve their knowledge level.

PYTHON language is a flexible language, practice is very important, so students are not required to memorize various grammar rules and formats, but need to master the ability to solve practical problems in the learning process to improve students' logical thinking ability. Therefore, practical operation plays an important role in the study of program design, and it affects the effect of program design teaching. Although each teaching method is different, the effect that it wants to achieve is consistent. Program design is inseparable from the teaching content and teaching objectives of program design and the audience's knowledge background and cognition. Adopt effective and scientific teaching methods that conform to the cognition of the audience will inevitably improve the teaching efficiency and can get twice the result with half the effort.

Based on the teaching concept of "online learning based on intelligent real-time monitoring", the teaching of PYTHON language programming based on online open courses was carried out in our school with positive feedback from students and good teaching effect, showing that this PYTHON language teaching mode was very effective. With the arrival of the era of artificial intelligence and big data, PYTHON language is bound to flourish. The hybrid teaching mode of PYTHON language based on online intelligent courses will be recognized and supported in the teaching of programming in different fields.

As an important part of PYTHON programming language, the experiment is a window to understand the students, which directly reflects the students' programming ability and level of programming thinking. Experiment is an essential part of PYTHON programming teaching and an important way to cultivate application-oriented programming talents. Experimental programming is the

most energetic and creative part during students' learning process. Adhering to the reform and innovation in the teaching field will surely make the intelligent laboratory a real base for theoretical research and scientific research, and a cradle for cultivating all kinds of new engineering and technical talents who have both a solid theoretical foundation and creative and practical capabilities. [7].

Through the diversified and all-round teaching and assessment mode, students' learning enthusiasm is greatly improved, which changes the previous passive learning attitude and increases their interest and enthusiasm in learning PYTHON programming language. It has comprehensively cultivated students' independent learning ability, practical ability and innovative thinking ability, and achieves good results in practice. In the future teaching, we will further optimize the teaching design and teaching methods, deepen the teaching reform, and innovate the assessment model, so as to better provide opportunities for the success of all kinds of students, meeting the needs of social talents, and promoting a virtuous circle of interaction between schools and society in the cultivation of talents.

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